Publications Repository
Ministry of Forests and Range

Controlling Weeds Using Biological Methods

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Controlling Weeds Using Biological Methods

INTRODUCTION

The Ministry of Forests is responsible for the maintenance and improvement of forest and rangeland in B.C. A major problem threatening the productive capability and ecology of some land administered by the Ministry of Forests is the invasion of noxious weeds.

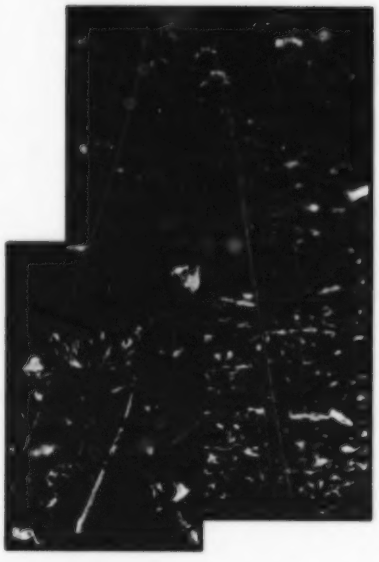
Noxious weeds are plants out of place. Many noxious weeds have been unintentionally introduced into B.C., often from Europe and Asia. They do not naturally occur here. As a result, their natural enemies, which would have evolved with them in their homeland, are not here. Without natural enemies, these plants have reproduced and spread extensively.

In many areas of B.C., uncontrolled spread of noxious weeds has reduced plant diversity, altered plant and animal habitat, and reduced the forage available for wildlife and livestock. Noxious weeds are generally unpalatable, occasionally poisonous, and can sometimes cause physical injuries to grazing animals. Noxious weeds have also infested many newly forested sites. At times, they have reduced the growth of forest seedlings and threatened seedling survival.

Leafy spurge (Euphorbia esula L.) *has infested this site in the southern interior of B.C.*

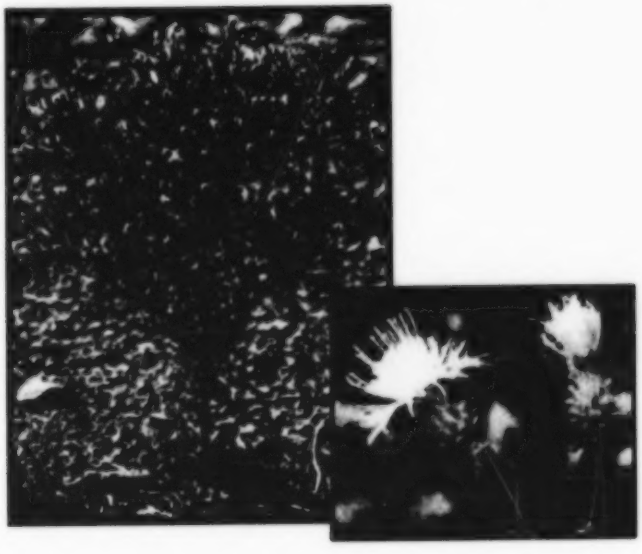
Spotted knapweed
(Centanurea maculosa)
is very common in B.C.

To date, more than 20 species of noxious weeds have infested about 100 000 hectares of grassland and dry forest land in B.C.



Noxious weeds must be controlled to levels that are socially and economically tolerable. The B.C. Ministry of Forests controls noxious weeds on land under its jurisdiction by using a variety of methods. These methods include preventing the spread of noxious weeds and controlling them with chemical, manual, mechanical and biological techniques, and by maintaining good range conditions. Biological control of noxious weeds in B.C. uses plant-specific insects to reduce the number of weeds.

Diffuse knapweed (Centanurea diffusa) *is very difficult to control.*



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THE BIOLOGICAL CONTROL PROGRAM IN B.C.

Agriculture and Agri-Food Canada pioneered the use of biological control agents in Canada. The first biological control program started in B.C. in the early 1950s. At that time, two beetle species were released to control the spread of St. John's Wort, a perennial weed that was a serious pest in fields and on roadsides. Since the 1950s, biological control work in B.C. has expanded to include noxious weeds such as knapweed, leafy spurge, toadflax, and hound's tongue. In 1984, the Ministry of Forests initiated a formal biological control program. The headquarters for the program is located at the Agriculture and Agri-Food Canada Research Station in Kamloops. From its inception, the program has involved screening, propagation, field release and monitoring of introduced biological control agents.

St. John's Wort (Hypericum perforatum L.) *has been successfully reduced in B.C. by biological methods.*

Much of the program's success is due to the cooperation among the agencies involved. The agencies participating with the B.C. Ministry of Forests include the B.C. Ministry of Agriculture, Fisheries and Food, Agriculture and Agri-Food Canada, the B.C. Cattlemen's Association and the International Institute of Biological Control (I.I.B.C.) in Switzerland.

Cyphocleonus achates (shown in its larval and adult stages) *is one of the biological agents used to control spotted knatweed*

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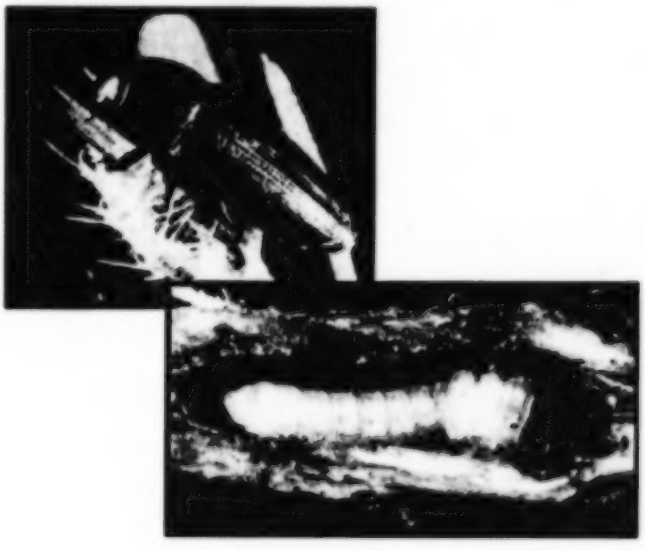
SELECTING SUITABLE BIOLOGICAL CONTROL AGENTS

Selection of a suitable biological control agent begins where the noxious weed originates. After careful consideration of potential agents, one species is selected, collected and rigorously screened by I.I.B.C. to ensure that it will harm only the target weed. Any selected agent that attacks non-target plant species native to North America or crops of economic importance is rejected.

Sphenoptera jugoslavica *(shown in its larval and adult stages) is used to control diffuse knapweed. It originates in eastern Europe.*



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Ensuring Agents Can Be Safely Introduced In North America

Two committees, one in Canada and the other in the United States, review the research to determine if the prospective agent can be introduced safely. If approved for release in North America, the agent is shipped to Agriculture and Agri-Food Canada's facility at Lethbridge, Alberta. The agent is quarantined at the facility to ensure it is free of native damaging parasites and pathogens.

Preparing Biological Control Agents For Release

Each new biological control agent destined for British Columbia is introduced into special tented plots at the Kamloops research station. Here the objective is to increase their population and to allow them to adapt to local conditions prior to their release. During this time, the life cycle and biology of the agents are studied. Procedures for collection, handling, shipping and release are also developed. Studies using tented plots have been in operation at the station since 1985.

Tented plots have been established by the Ministry of Forests at the Agriculture and Agri-Food Canada Research Station in Kamloops for biological control studies.

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Releasing Agents In The Field

Biological control agents are released primarily by Ministry of Forests staff. They are often assisted, however, by staff of the Ministry of Agriculture, Fisheries and Food, the Ministry of Transportation and Highways, and the general public.

The initial sites for field release are chosen carefully to ensure that the agents will survive under field conditions. These release sites must contain a sufficient number of the target noxious weeds to support the biological control agents.

Yellow toadflax (Linaria vulgaris L.)

Once the agents have increased their numbers on field sites, they are collected and redistributed to other locations. This increases their geographic distribution, improving their control of weeds.

Biological control agents can be hand picked, vacuum aspirated or gathered with nets. Minimal handling and prompt release of agents improves the success of their introduction.

Monitoring Agents In The Field

Release sites are monitored for one to two years to determine if the agents are established. Once they are

established, selected sites are monitored to determine the population size, spread and efficacy at controlling the noxious weeds.

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SUMMARY OF BIOLOGICAL CONTROL RELEASES

Since 1952, over 50 insects and pathogens have been released in B.C. to control more than 20 introduced weed species. Introduced agents include aphids, beetles, moths and flies. The time required for agents to establish and effectively control the target noxious weed has varied depending on the agent, the site and the environmental conditions at the time the agent was release Most noxious weeds require more than one agent for successful control. Agents have been released on the following noxious weeds:

Diffuse and Spotted Knapweed

Knapweeds are widely distributed in the province, infesting more than 80 000 hectares of rangeland and significantly reducing the amount of forage available for wildlife and grazing livestock. Both noxious weeds contain extremely bitter tasting oils. Twelve biological control agents have been introduced to control these plants. Of these, five are root feeding insects and seven attack the seed head.

Aphthona nigriscutis *(shown in its larval and adult stages) is used to control leafy spurge.*

Leafy Spurge

This perennial weed occurs in isolated pockets in the Thompson, Cariboo, Boundary, East Kootenay, Nechako, North Okanagan and Bulkley Valley areas. It contains a milky-coloured juice that can poison livestock. Five biological control agents are available to control leafy spurge. Two root feeding flea-beetles and a moth are established in the field. Leafy spurge is under control by one of the root feeding fleabeetles on restricted habitats

throughout the province.

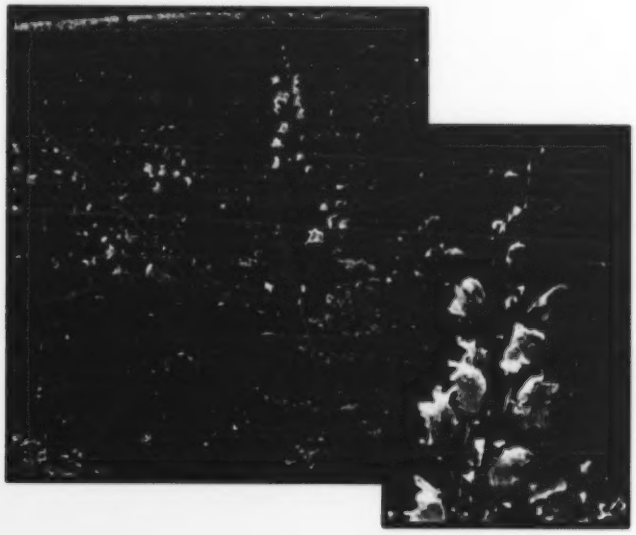
Leafy spurge (Euphorbia esula L.) *before release of the biological eontrol agent (30/ 6/89).*

Leafy spurge after the release of Aphthona nigriscutis (1/7/93).

Yellow and Dalmatian Toadflax

These perennial weeds spread by seed and creeping roots. Toadflax is distributed throughout the Okanagan, Similkameen, Thompson, East Kootenay and Cariboo areas. Two root feeding insects, two seed head feeding agents and one stem feeding insect are being raised at the Kamloops facility for control of toadflax. Plans are being made for initial field release.

Dalmation toadflax (Linaria dalmatica)



Mecinus janthinus *(shown in its larval and adult stages) is used to control yellow and dalmation toadflax.*

Hound's Tongue

Hound's tongue is toxic to livestock and some wildlife. Four agents are being screened for this biennial weed that infests open forest sites, roadsides and other disturbed areas. Plots have been established at the propagation facility to receive the agents once they are approved for release.

Hound's tongue (Cynoglossum officianle L.)

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CONCLUSION

Biological control has been successful in B.C. for some noxious weeds. One success story is the control of St. John's Wort. As well, nodding thistle and leafy spurge are being controlled in some areas through biological means. Although biological control is an important tool for combating noxious weed infestations, it can only succeed when used with integrated weed management and good land management practices. Integrated weed management includes prevention. Simple actions that can greatly reduce the spread of these weeds include:

- Pulling and destroying noxious weeds before they produce seed.
- Rehabilitating disturbed land, within and adjacent to infested areas, with desirable, fast-growing vegetation.
- Minimizing disturbance on lands that may be susceptible to noxious weed encroachment.
- Traveling only on established roads in noxious seed infested areas
- Checking for and removing noxious weeds caught on vehicles when leaving infested areas.

FOR FURTHER INFORMATION

To receive further information on the biological control program in British Columbia, contact:

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BRITISH COLUMBIA

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